
Gentianella weigendii (Gentianaceae), an Unusual New Gentian from Peru

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ABSTRACT. *Gentianella weigendii* J. S. Pringle is described as a new species from Peru. It is distinctive among the South American species of *Gentianella* Moench (Gentianaceae) in its combination of green corollas scarcely longer than the calyces, stamens inserted at different levels on the corolla tube, and raised nectaries.

RESUMEN. Se describe *Gentianella weigendii* J. S. Pringle, una nueva especie del Perú. Es distintiva entre las especies de *Gentianella* Moench (Gentianaceae) de América del Sur por la combinación de las corolas verdes poco más largas que los cálices, los estambres insertos a niveles diversos en el tubo de la corola, y los nectarios sobresalientes.

Key words: Gentianaceae, *Gentianella*, IUCN Red List, Peru.

Gentianella Moench, formerly usually included in *Gentiana* L., comprises ca. 300 species, of which ca. 200 are endemic to the high mountains of South America. This genus attains its greatest diversity in Peru, where ca. 90 species are native. New species of *Gentianella* continue to be discovered in South America, one of which is described here.

Gentianella weigendii J. S. Pringle, sp. nov. TYPE: Peru. Ancash: Sihuas, rd. from Sihuas to Yanac before Pomabamba turnoff, 10 Mar. 2001, M. Weigend, K. Weigend, M. Binder & E. Rodríguez 5083 (holotype, HUT digital image; isotypes, HAM, M digital image). Figure 1.

Haec species inter congeneros austroamericanos corollis viridibus calycibus vix longioribus, staminibus inaequalibus et nectariis prominentibus distinguenda.

Herb, glabrous throughout; plants probably monocarpic, remaining in vegetative stage for a lengthy period before flowering; primary stem single; oldest portion covered with bases of old leaves; flowering stem erect, hollow, stout, 3–6 dm, 10–20 (proximally) to 4–6 (distally) mm diam.; strongly ascending floriferous branches arising from all axils above basal rosette, proximal and mid-cauline branches to 11 cm on larger plants, distal branches shorter, peduncle-

like. Leaves basal and cauline; basal leaves present during flowering and fruiting (16 to 40 green basal leaves on specimens seen, many more in various stages of disintegration); basal leaves linear, 7–12 cm \times 4–13 mm, acute to acuminate but with extreme tip obtuse; cauline leaves in whorls of 4, widely spaced (mid-cauline internodes mostly 4–10 cm), proximal cauline leaves similar to basal leaves, distal leaves gradually more lanceolate, shorter, and more strongly acuminate, mid-cauline leaves mostly 2.5–7 cm \times 7–13 mm; bases not connate-sheathing, margins smooth. Inflorescence an elongate thyrses of leafy-bracted cymes on distal parts of primary stem and branches; flowers erect; pedicels in terminal cluster 5–15 mm or 1 to 3 central pedicels to 25 mm, elevating central flowers above lateral ones; flowers 6 to 15 in terminal clusters, fewer and with shorter pedicels in clusters in distal axils and on branches; total flowers per stem 60 to 250 or more; flowers on proximal branches sometimes \pm reduced. Flowers pentamerous; calyx 8.5–14 mm, lobed 0.45–0.65 \times its length; lobes erect, narrowly triangular, acute, unequal in quincunxial pattern with outermost longest and widest, overlapping margins narrowly decurrent on tube; intracalyxine colleters absent; corolla green, nearly cylindrical, 9–16 mm, 1–1.25 \times as long as calyx, lobed 0.35–0.45 \times its length; lobes equal, widely ovate-triangular, 3.5–5.5 \times 3–4.5 mm, ca. 1.25 \times as long as wide, obtuse, conspicuously overlapping adjacent lobes where widest; corolla trichomes absent; nectaries 5, on corolla tube near base, probably purple when fresh, sharply defined and raised above adaxial corolla surface, oblong, ca. 1.2 mm, shallowly emarginate; stamens with all anthers presented approximately at same level but with filaments inserted at different levels on corolla tube, filaments 1.5–3 mm within a single flower, inserted at 0.8–0.9 \times height of tube; anthers dark blue, ca. 1.7 mm; ovary compressed-cylindrical, stipe ca. 1 mm at anthesis; stigmas narrowly elliptic-spatulate, ca. 1.4 \times 0.6 mm. Capsule not winged; stipe scarcely elongating, little or no more than stigmatic lobes of mature capsule exerted from marcescent corolla; seeds brown, irregularly ellipsoid, ca. 0.9 \times 0.7 mm; seed coat obscurely reticulate.

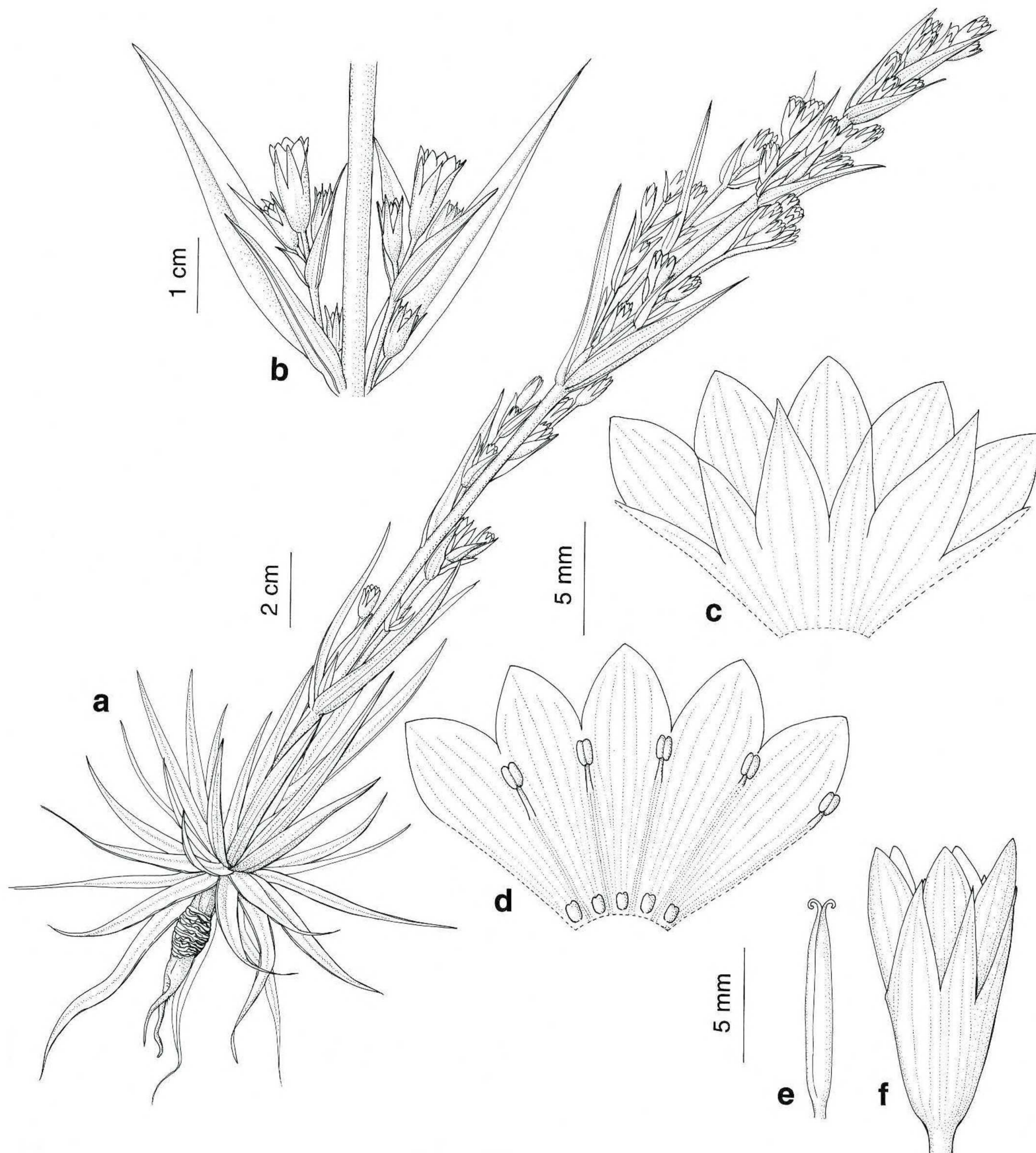


Figure 1. —A. Fertile plant. —B. Mid-cauline node with axillary flowering branches. —C. Perianth, abaxial view. —D. Corolla, adaxial view, with stamens and nectaries. —E. Pistil. —F. Intact flower. Drawn from type images, *Weigend et al.* 5083 (HAM, HUT, M).

Habitat and phenology. *Gentianella weigendii* is known only from the type collection. It was found in well-developed jalca vegetation, among numerous shrubs and perennial herbs, at 4000 m (*Weigend et al.* 5083, in sched.). The March date of this collection provides the only information available on its phenology.

IUCN Red List category. Data are deficient for recommended listing (DD) (IUCN, 2001). With the species being known only from a single locality in

northern Ancash Department, it seems likely that its total geographic range is not extensive, although according to Maximilian Weigend (pers. comm., 23 June 2009), *Gentianella weigendii* was locally common at the type locality.

Etymology. *Gentianella weigendii* is named for Maximilian Weigend, of the Institut für Biologie–Systematische Botanik und Pflanzengeographie–der Freien Universität der Berlin, who collected the type specimen and thought that it represented a new

species. The name recognizes Dr. Weigend's extensive botanical exploration in Peru and his description of many new species.

Discussion. According to Weigend (pers. comm., 2009), *Gentianella weigendii* was highly homogeneous at the type locality. That the corollas were green when fresh was stated by the collectors (in sched.) and observed in a digital image provided by Weigend for this study. Observations of flowers in various stages in the type collection, as well as fruits surrounded by marcescent corollas, confirm that the corollas of this species remain small and green.

As observed in the image of fresh material noted above, the leaves, calyces, and corollas of *Gentianella weigendii* are bright medium green when fresh, contrasting with the pale yellowish green of the stout stem. In both fresh material and herbarium specimens collected in flower, the corolla color does not differ appreciably from that of the leaves and calyces, except for a narrow paler zone proximally along the margins of the corolla lobes. Otherwise, in South American *Gentianella*, green corollas similar in color to the leaves and calyces occur only in *G. chlorantha* J. S. Pringle, a highly dissimilar Peruvian species with numerous, closely spaced leaves only 6–8 mm, and in *G. thyrsoides* (Hook.) Fabris, with which *G. weigendii* is contrasted below.

Corollas largely concealed by the calyces occur only in *Gentianella weigendii* and *G. thyrsoides* in South American *Gentianella*; in all other species the corollas are proportionately longer and more conspicuous. The widely ovate-triangular corolla lobes of these two species are also unusual in South American *Gentianella*. This corolla-lobe shape, with the lobes shorter than the tube, is approached in the Ecuadorian *G. jamesonii* (Hook.) Fabris, which has red corollas much exceeding the calyx, but in most of the species native from Peru north to Colombia the corolla lobes are elliptic to obovate, widest near or distal to the middle. Ovate corolla lobes occur in several species in Argentina and Bolivia, but all of those species differ distinctly from *G. weigendii* in vegetative characters and inflorescence form as well as in their showier corollas.

Nectaries sharply defined and distinctly raised above the adaxial corolla surface are known in *Gentianella* only in *G. weigendii* and *G. florida* (Griseb.) Holub, having been reported in the latter species by Filippa and Barboza (2006) and subsequently seen in this study (Nee 40342, HAM). The nectaries of *G. florida* are less prominently raised than those of *G. weigendii*. *Gentianella florida*, which is native to Argentina and Bolivia, is one of a group of florally heteromorphic species with showy, corymbi-

form cymes and white, yellow, or lilac corollas. None of the species in that group is similar to *G. weigendii*. In all other species, as far as is known, the nectaries, if any, are patches of small cells on the corolla tube below each lobe, usually U- or V-shaped, not raised above the adaxial surface of the tube.

Androecial zygomorphy, with the filaments inserted at different levels on the corolla tube and differing in length, has not previously been reported in *Gentianella*. In the flower from which Figure 1 was drawn, the corolla of which was 14 mm with the tube 9 mm, one filament was 2.5 mm from its insertion to the point of attachment to the anther, those of the stamens on each side were 2 mm, and those of the other two stamens were 1.5 mm. In another corolla, which was 15 mm, the filaments ranged from 1.5–3 mm. The shorter filaments are inserted higher on the corolla tube, elevating all five anthers to approximately the same level. All of the stamens are inserted in the distal fifth of the corolla tube but distinctly below the sinuses.

In habit, *Gentianella weigendii* has much in common with *G. weberbaueri* (Gilg) Fabris, which is likewise native to Ancash Department and to which it may be closely related. Both species have a single stout, hollow primary stem, with numerous strongly ascending branches at nodes from near the base to the summit; persistent basal leaves, more than 50 flowers per stem, in an elongate thyrse; narrowly triangular calyx lobes about as long as the tube; and corolla lobes distinctly shorter than the tube. Both lack calycine colleters and corolline trichomes. The flowers of *G. weberbaueri*, unlike those of *G. weigendii*, are showy, exerted well beyond the subtending bracts on pedicels 1.5–7 cm, and are more or less nodding. The corollas are purplish red, 20–50 mm, with spatulate-elliptic lobes 0.25–0.4× as long as the tube. The filaments of *G. weberbaueri* are 10–20 mm, all inserted at the same level about 0.5× the height of the corolla tube. The nectaries are neither conspicuous nor raised.

Gentianella weigendii shares several morphological traits uncommon in *Gentianella* with *G. thyrsoides*, and may be closely related to that species as well as to *G. weberbaueri*. *Gentianella thyrsoides* is a relatively widespread species in Peru, known from central Ancash Department but not seen by Weigend et al. where they found *G. weigendii* in northern Ancash. In both *G. weigendii* and *G. thyrsoides*, the stem is solitary, stout, and hollow; basal leaves are present at flowering time; the cauline leaves are whorled; the inflorescence is a leafy-bracted, many-flowered thyrse with strongly ascending branches; the flowers are erect on short pedicels; the calyx lobes are narrowly triangular; adaxial calycine colleters and

corolline trichomes are absent; the corollas are green and scarcely longer than the calyces; and the corolla lobes are ovate-triangular, shorter than the tube. The flowers of *G. weigendii* and *G. thyrsoides* are similar in aspect, but in *G. thyrsoides* the filaments are equal, 5–8 mm, all inserted at the same level about 0.5× the height of the corolla tube. At 10–60× magnification I detected no floral glands in *G. thyrsoides* (Weigend et al. 5125 and 7712, HAM), but observations with fresh material and with SEM would be desirable.

Vegetatively, *Gentianella weigendii* and *G. thyrsoides* differ distinctly. Plants of *G. thyrsoides* are 0.2–3.5 dm; those of *G. weigendii* are 3–6 dm. In *G. thyrsoides* the basal and near-basal leaves are very numerous, often over 100, and the cauline leaves are closely spaced the entire length of the stem (distal internodes commonly 2–8 mm, occasionally to 15 mm, rarely to 40 mm on the tallest plants). The leaves are ascending and distally incurved, and in combination with the closely spaced axillary cymules, often conceal much of the stem. All of the leaves are narrowly linear, mostly 1–7 cm × 1–3 mm exclusive of the abruptly expanded portion just above the basal sheath, reminding Ruiz and Pavón of pine needles (as indicated by the old epithet *pinifolia*). The leaves are about eight per whorl at the mid-cauline nodes, more numerous at the proximal nodes, with the bases united into a sheath, which is 8–12 mm on the larger plants. The entire plant above ground forms a dense cylinder 2–6 cm in diam. In *G. weigendii* the basal leaves are fewer and wider, 7–12 cm × 4–13 mm; the distal cauline leaves are lance-triangular, 2.5–7 cm × 7–13 mm; and the leaves are not expanded near the base. The mid-cauline internodes are mostly 4–10 cm and the leaves spread widely, so that much of the stem is visible. The cauline leaves are in whorls of four, separate to the base.

From Gilg's description of *Pitygentias* Gilg, which he segregated from South American *Gentiana* s.l. in 1916, it might be suspected that *Gentianella weigendii* had already been described, but no earlier specific epithet is available for this species. Gilg treated *Pitygentias* as comprising two species, both of which are now included in *Gentianella thyrsoides* (Fabris, 1958). Although in 1916 Gilg described the nectaries of *Pitygentias* as five calluses between the adnate portions of the stamens, he included in *P. thyrsoides* (Hook.) Gilg plants that he (Gilg, 1896) had previously described as *Gentiana tupa* Gilg, in which he had said that the nectaries were scarcely conspicuous. The material that he identified as *P. pinifolia* (Ruiz & Pav. ex G. Don) Gilg in 1916 included flowers preserved in alcohol, received from

August Weberbauer, as well as herbarium specimens. If Weberbauer's botanizing had extended to the range of *Gentianella weigendii*, it might be that Gilg's description of the nectaries of *Pitygentias* was based on alcohol-preserved flowers of *G. weigendii*, whereas the herbarium specimens that he identified as *P. pinifolia* and *P. thyrsoides*, and earlier as *Gentiana tupa*, represented *Gentianella thyrsoides*. The name *Gentiana tupa* was based on plants from Diezmo, Peru. A Ruiz and Pavón specimen from Diezmo at BC (according to Ibáñez, 2006), and a Ruiz and Pavón collection (now divided, F and MA) interpreted by Fabris (1958) and Macbride (1959) as an isotype of the name *Gentiana pinifolia*, were both designated by the same unpublished name by Ruiz and Pavón in herb., and both were annotated as *P. pinifolia* by Gilg. These specimens are probably from a single collection, of which I identified a component as *Gentianella thyrsoides*. The type of the basionym *Gentiana thyrsoides* Hook. (*Cruikshanks s.n.*, BM) likewise represents the species to which the name *Gentianella thyrsoides* is currently applied.

Although the similarities of *Gentianella weigendii* to *G. thyrsoides* and *G. weberbaueri* have been noted above, little evidence, morphological or molecular, exists to indicate the phylogenetic relationships among the South American species of *Gentianella* or between the South American species and those of other continents. Divisions of *Gentianella* (historically included in *Gentiana*) into sections have included all species, or all except *G. magellanica* (Gaudich.) Fabris ex D. M. Moore, in a single section, and divisions of *Gentianella* into segregate genera subsequent to Gilg's recognition of *Pitygentias* have not discussed South American species. Some character states occur in diverse combinations rather than consistently occurring in syndromes, suggesting the frequent occurrence of homeoplasy. Molecular phylogenetic studies have indicated that *Gentianella*, exclusive of a small clade comprising Asiatic species with paired nectaries, is monophyletic (Hagen & Kadereit, 2001), but few South American species have been included in such studies to date.

Weigend et al. (Weigend et al. 5083, in sched.) suggested that the flowers of *Gentianella weigendii* might be cleistogamous. Self-pollination has been demonstrated in some Gentianaceae, including some high-altitude grassland species in South America (Freitas & Sazima, 2009), but studies of pollination in South American *Gentianella* have remained speculative, despite the interest engendered by the diverse floral morphology among these species. Gilg (1916) reported that the flowers of *G. thyrsoides* (as *Pitygentias* spp.) appeared to be cleistogamous, as

indicated by the presence of expanded ovaries with seeds in advanced stages of development even in the youngest flowers he examined. In *G. weigendii*, the perianth concolorous with the leaves and bracts appears to support the hypothesis of cleistogamy, but prominent floral nectaries are not usually associated with autogamous pollination. The productivity of the nectaries as observed in fresh flowers would be of interest. Observations of *G. weigendii* in the field would also be of interest, to see whether its flowers are visited by insects or other pollinators and if so by what kinds, as would experiments to determine whether seed is set in flowers from which potential pollinators are excluded.

Acknowledgments. I am grateful to Maximilian Weigend for his sending me a component of the type collection, for a digital image of fresh material of *Gentianella weigendii*, for supplementary information on *G. weigendii* at the type locality, and for his arranging for me to receive images of the replicates of the type collection that he had sent to other herbaria. I am grateful to K. Bernhard von Hagen and Eric F. Rodríguez R. for their providing digital images of the specimens at M and HUT. I am greatly pleased to illustrate this new species with drawings by Barbara Alongi.

Literature Cited

- Fabris, H. A. 1958. Notas sobre *Gentianella* del Perú. Bol. Soc. Argent. Bot. 7: 86–93.
- Filippa, E. M. & G. E. Barboza. 2006. Gentianaceae Juss. Flora Fanerogámica Argentina 102. Programa PRO-FLORA-CONICET, Córdoba.
- Freitas, L. & M. Sazima. 2009. Floral biology and mechanisms of spontaneous self-pollination in five Neotropical species of Gentianaceae. Bot. J. Linn. Soc. 160: 357–368.
- Gilg, E. 1896. Beiträge zur Kenntnis der Gentianaceae. I. Bot. Jahrb. Syst. 22: 301–347.
- Gilg, E. 1916. Gentianaceae Andinae. B. *Pitygentias*, eine neue Gattung der Gentianaceen aus Peru. Bot. Jahrb. Syst. 54(Beibl. 118): 90–92.
- Hagen, K. B. von & J. W. Kadereit. 2001. The phylogeny of *Gentianella* (Gentianaceae) and its colonization of the southern hemisphere as revealed by nuclear and chloroplast DNA sequence variation. Organisms Diversity Evol. 1: 61–79.
- Ibáñez i Cortino, N. 2006. Estudios sobre Cinc Herbaris Històrics de l'Institut Botànic de Barcelona. Ph.D. Dissertation, Universitat de Barcelona, Barcelona. [Specimens also listed in electronic supplement to Ibáñez et al., 2006.]
- Ibáñez i Cortino, N., J. M. Montserrat & I. Seriano. 2006. Collections from the Royal Spanish Expeditions to Latin America in the Institut Botànic de Barcelona (BC), Spain. Willdenowia 36: 595–599. <http://www.bgbm.org/WILLDENOWIA/willd36_1_Special_Issue/Ibanez+al.pdf>, accessed 2 November 2011.
- IUCN. 2001. IUCN Red List Categories and Criteria, Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland, and Cambridge, United Kingdom.
- Macbride, J. F. 1959. Gentianaceae. Gentian family. Flora of Peru. Publ. Field Mus. Nat. Hist., Bot. Ser. 13(5): 270–363.